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THE ACTION OF COLD ON MICROPHYTES.¹

PROFESSOR MCKENDRICK, of Glasgow, gave at the recent meeting of the British association an interesting account of the methods of trying to destroy small organisms like bacteria, not as is commonly done by heat, but by cold. It is known that by means of Coleman's cooling machine meat may be kept from putrefying for a considerable time, but in attempting to sterilize a putrescible solution by means of cold, it was found that, though in some cases putrescence was delayed, in no case were the organisms completely destroyed. Organic fluids were exposed to temperatures more than 120° below 0° F., but on thawing they were found to contain living organisms still. Thus the hope of preserving putrescible matter by means of cold—an important economical result—is, so far as investigation yet goes, destroyed. The organisms under cold seem to be in a nearly solid state, though we cannot call it a chrySTALLINE state. In a paste solution the water is chrySTALLIZED under cold, the paste remaining spongy. Possibly cold may separate from these minute organisms the water they contain, and this water is again absorbed on thawing. Meat under cold becomes very friable, while yet minute fragments of it show the same microscopic constitution of muscle. It is well known that frogs have been found in blocks of ice and been revived. Frogs have been frozen at 20° F. in about half an hour. On thawing slowly, the animal, in two instances, completely recovered. When it was frozen for longer than half an hour it did not recover; but, though reflex action was gone, there remained some irritability both in nerves and muscles. It was found also that certain vital functions may be arrested by cold, and thus conceivably higher organisms may be kept vitally inert for an indefinite time. Experiments were also tried on warm-blooded animals. A rabbit subjected to a temperature 100° below 0° F. recovered. No temperature lower than 73° below 0° F. has been obtained in free atmosphere.

PRELIMINARY REPORT OF THE COMMISSION APPOINTED TO REPORT ON THE SPANISH EARTHQUAKES.

THE commission appointed by the Spanish government to investigate the Andalusian earthquake of December 25, 1884, has made a preliminary report of its labors and conclusions up to March 7, 1885 (*Terremotos de Andalucía*, Madrid, 1885, 107 p.). This report is based upon a personal examination, which the members of the commission made of the region affected, and upon some

thousands of answers received in response to a series of interrogations which were widely distributed. A more detailed discussion of their work is to follow at a later date. This report, however, deals quite fully with the matter in hand, and states conclusions which, although often only negative, are yet of considerable interest. We must be content with presenting here a brief *résumé* of its contents.

Beginning with a statement in seven pages of the theories proposed by various writers to account for earthquakes, classifying them as volcanic or non-volcanic, and attributing them to the internal heat of the earth, to the presence of vapors of high tension, or to the solution of the rocks by subterranean waters; it proceeds to give in seven pages more a description of the orography and hydrography of the two provinces of Granada and Malaga, and then devotes twenty-one pages to the geology of the same district, describing in detail the rock formation, with the location and direction of its principal fault lines.

Coming to the present occasion, a brief discussion of the times observed at different places leads only to the conclusion that the origin is to be sought to the west of Granada and east of Malaga, any exact result being vitiated by the uncertainty of the time data; this being due to the lack of good clocks and to the fact that, in places where much damage occurred, the attention of the inhabitants was pretty thoroughly occupied with caring for their own safety. The area affected is described as limited toward the north by Madrid and Segovia, toward the west by Cáceres and Huelva, toward the east by Valencia and Murcia, and on the south by the Mediterranean; but the tremor of the earth was also indicated by instruments even so far distant as Rome and Brussels. Examination of the direction of the cracks in the ground and in buildings, as well as of the curves of intensity, estimated according to the Rossi-Forel scale, leads to the conclusion that the focus is to be found in the valley of Zafarraya, where the greatest damage was caused.

The latter half of the report is mostly occupied with the phenomena preceding, accompanying, and following the earthquake, such as, changes in the course of streams, perturbations of magnetic apparatus, barometric depression preceding the shock, subterranean noises, dynamic effects, etc. In estimating the amount of damage done, the number of buildings injured in the two provinces of Granada and Malaga is stated as 17,178, of which number 4,399 are classed as totally destroyed. The injured persons were: 745 dead, 1,485 wounded. In discussing the causes of this earthquake, the commission accepts the Italian

¹ From *Nature*.

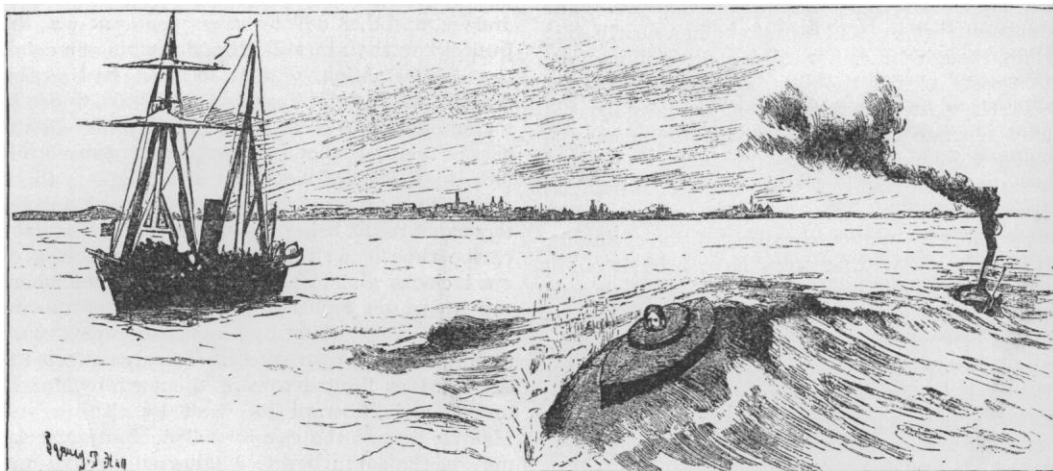
theories, attributing the earthquake to the tension of vapor of water in the subjacent strata. The valley of Zafarraya, indicated above as the probable focus, is a locality where much water gathers and easily penetrates beneath the surface, and to the vapor of high tension produced from the water here collected in deep-lying strata are attributed the forces which gave rise to the present earthquake. It is assumed that in general the lines of seismic propagation, following crevices in the strata beneath the surface, will accord with the direction of the surface water courses. On this idea, the principal radiant lines from Zafarraya were along the rivers Marchau and Genil; a view which is regarded as confirmed by the phenomena in the Sierras Tejeda, Marchamonas, and Eumedio, where large crevasses occurred parallel to the

will be awaited with interest, and will doubtless contain valuable additions to the science of seismology.

The report is signed by Manuel Fernandez de Castro, Juan Pablo Lasala, Daniel de Cortázar, and Joaquin Gonzalo y Tarin.

THE NORDENFELT SUBMARINE BOAT.¹

JUST before leaving Denmark for the south, the Prince of Wales, with the King and Queen of Denmark and the Czarina, witnessed off Landskrona, a town on the Swedish coast, an interesting and successful trial of the new submarine boat, which has been built at Stockholm upon the plans of Mr. Nordenfelt, the inventor of the machine gun so extensively used in modern warfare. Ever



THE TRIAL OF THE NORDENFELT SUBMARINE BOAT AT LANDSKRONA, SWEDEN.

direction here indicated. In the province of Malaga the principal seismic effects were found in the vicinity of Periana, adjoining the district designated as the focus, but on the other side of the sierra, which separates the two provinces, and here the principal radiant line followed the course of the river Velez.

Theoretical considerations suggesting that the area affected should approximate in form to an ellipse, this is found to agree with the observations; but the data at hand do not suffice for any exact determination of the direction and velocity of the movement, nor of the depth of the focus.

In conclusion, then, the report fixes upon Zafarraya as the focus of this earthquake, and suggests a probable cause for it in the subterranean waters gathered there; but more exact results are yet wanting, and may very likely remain so, even when the fuller report is issued. This, however,

since the American civil war, naval engineers have been striving to solve the problem of submarine navigation, but until now with very little success. Mr. Nordenfelt's invention, however, appears to fulfill the numerous requirements necessary for overcoming the difficulties and dangers of maintaining, driving and directing a boat beneath the water. The boat is built of steel, and is cigar-shaped, with a glass conning-tower in the centre, from which the commander can keep a look-out. This dome is protected by a strong iron cover. There are three engines, one to work the screw in the stern which propels the vessel, and two to work the propellers on either side, which, when set in motion, compel the boat to sink, and maintain her at a certain depth beneath the surface. When it is wished to sink the boat, enough seawater is taken in to reduce the buoyancy till the

¹From the London Graphic.